1. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

   A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 2 bacteria-α. After 3 hours, the petri dish has 52 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

   A. About 378 minutes

   B. About 63 minutes

   C. About 229 minutes

   D. About 38 minutes

   E. None of the above

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2. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

   A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 1 hours, the petri dish has 21 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

   A. About 20 minutes

   B. About 125 minutes

   C. About 34 minutes

   D. About 209 minutes

   E. None of the above

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3. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 871 grams of element X and after 7 years there is 87 grams remaining.

A. About 1095 days

B. About 1 day

C. About 730 days

D. About 3285 days

E. None of the above

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4. A town has an initial population of 70000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	69880	69520	68080	62320	39280	0	0	0	0

A. Exponential

B. Logarithmic

C. Linear

D. Non-Linear Power

E. None of the above

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5. A town has an initial population of 100000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	100018	100046	100058	100086	100098	100126	100138	100166	100

A. Non-Linear Power

B. Linear

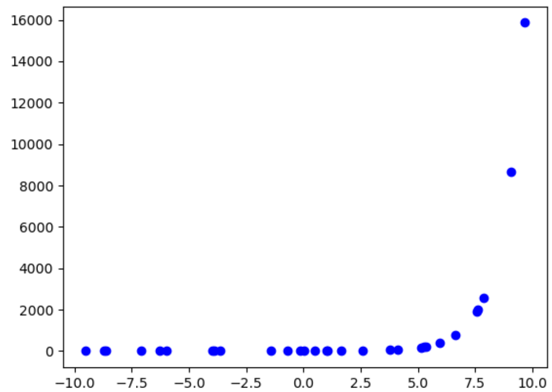
C. Logarithmic

D. Exponential

E. None of the above

---

6. Determine the appropriate model for the graph of points below.



A. Logarithmic model

B. Linear model

C. Non-linear Power model

D. Exponential model

E. None of the above

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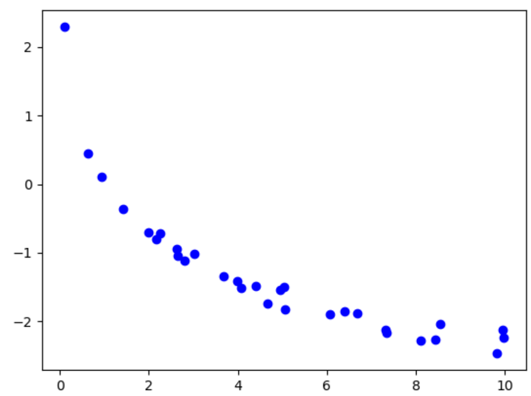
7. Determine the appropriate model for the graph of points below.



A. Logarithmic model

B. Exponential model

C. Non-linear Power model

D. Linear model

E. None of the above

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8. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of $100°$ *C and is placed into a* $12°$ *C bath to cool. After 40 minutes, the uranium has cooled to* $42°$ *C.*

A. $k = -0.01517$

B. $k = -0.02440$

C. $k = -0.01552$

D. $k = -0.03010$

E. None of the above

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9. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of $140°$ *C and is placed into a* $16°$ *C bath to cool. After 25 minutes, the uranium has cooled to* $98°$ *C.*

A. $k = -0.02140$

B. $k = -0.03029$

C. $k = -0.02967$

D. $k = -0.04672$

E. None of the above

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10. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 559 grams of element X and after 4 years there is 69 grams remaining.

A. About 1 day

B. About 365 days

C. About 365 days

D. About 1825 days

E. None of the above
